

The Carbon Capture Project: Technology Solutions for Environmental Needs



Currently, fossil fuels supply 75% of the world's energy. But dramatic reductions in CO₂ emissions may be needed to meet national and international greenhouse gas reduction targets. The best way to reduce CO₂ emissions at the source is to implement CO₂ capture technology.

Technologies are available today for capturing CO₂ from exhaust gases, but these are expensive to integrate and maintain, making them unlikely solutions, especially where regulation does not exist. The cost of separating and capturing CO₂ from exhaust gases can account for as much as 75% of the total cost of an integrated system. For the power generation industry, this cost is too high. The challenge is to develop affordable, large-scale post-combustion capture, separation and sequestration technology.

Established in May, 2000, and co-funded by the Department of Energy, European Union, Norway Klimatek, and eight major international energy companies, this consortium has taken on the challenge to develop new, breakthrough technologies to reduce the cost of CO₂ separation, capture, transportation, and sequestration from flue gases in both existing and new power generation facilities.

Who Are They?

Aptly named the Carbon Capture Project (CCP), this international team--led by BP, and including ChevronTexaco, Norsk Hydro, ENI, Pan Canadian, Royal Dutch/Shell, Statoil and Suncor Energy--brings unparalleled technical expertise and a commitment to reducing greenhouse gas emissions, expressed in their public announcement May 4, 2000:

"We share society's concern over the issue of climate change. While each member company is actively working to manage its own greenhouse gas emissions through a portfolio of initiatives, this project underscores our joint commitment to developing innovative ways to address the climate change issue. Pooling our technical and financial resources in this way will give the project added impetus."

Not only does this team represent a significant market for the technologies they'll develop (their combined annual emissions equals 175 million tonnes (193 million tons) of CO₂, nearly 32% of the total CO₂ emissions in the world), participating companies also own many of the geologic sinks that could be used to store the CO₂. This team provides a unique, direct path from research and development to commercial use that will speed carbon capture technologies into industrial use.

What Will They Do?

Goals of the CCP are threefold: prove that safe, cost-effective technology can be developed; develop and thoroughly test it, then make it available for commercial use. Proving that the technology can be implemented at a low cost is an important part of its marketability. Low-cost technology means affordable integration and reduced penalty (an industry term for reduced fuel efficiency, and therefore increased operational cost, as a result of improvements, repairs, or changes to a power generation system).

By the end of 2003, CCP capture and storage technology innovations will reduce integration costs by 50% over best available capture technology for use in existing power generation plants, and by 75% for new facilities.

This project makes great strides towards the Department of Energy's long-term goal of substantially minimizing the cost of capture and sequestration in power generation systems, and will accomplish this in three years. The CCP project considers the entire carbon sequestration "life-cycle" of separation, capture, transport, and safe storage (including monitoring, verification, and risk assessment) so that total "system" costs can be reduced.

How Will They Do It?

The 2003 target date is not far off, and a clear plan of action is in place. The Carbon Capture Project is made up of separate, but complementary work programs performed by over 30 preeminent industrial and research organizations in the United States, the European Union, and Norway.

Research efforts ramp up the project with computer modeling and laboratory experiments to prove that advanced CO₂ separation and capture technologies will work as expected. Research will target three areas for separation and capture: post-combustion methods, pre-combustion decarbonization, and oxyfuel.

Using current and best technologies as a basis, researchers will establish a lifecycle for CO₂ separation, capture and sequestration costs. Then, they'll analyze these costs to compare alternatives, and direct the research towards the most efficient and cost-effective approach. The goal of the resulting technology is to reduce costs to provide the power generation industry with an affordable system of reducing CO₂ emissions.

The CCP also aims to develop the safest, most cost-effective storage solutions. As with any new breakthrough technology development, there are significant uncertainties and risks. The CCP has committed a full 45% of project funds to maximize safe geologic storage, which means measuring and verifying sequestration volumes, as well as assessing and mitigating sequestration risks.

What Will the Technology Be?

The potential scientific breakthroughs that could result from this project:

- New solvents and/or contractors that reduce the cost of CO₂ separation
- Post-capture handling of CO₂
- H₂ generation processes integrated with CO₂ capture

- Understanding the production of fuel-grade H₂ and its combustion properties
- Advanced oxyfuel boiler design
- Low-cost oxygen production systems for use with combustion
- Controls and requirements for geologically storing CO₂

What Does This Mean to Me?

Potentially, resulting technology could reduce the emissions of the industrial CCP participants by 10 million tonnes of carbon per year (11 million tons,). When applied more broadly in industry, up to 140 million tonnes of carbon per year (154 tons, the amount of emissions produced by Australia, Belgium, and Ireland each year) could be captured.

Though the new technology will initially be used by the participating CCP energy companies, ultimately coal producers, electric power utilities, and independent power producers will be encouraged to implement what the DOE and CCP hope will be environmentally acceptable technology approaches to reduce man-made emissions and overall atmospheric concentrations of CO₂ to the benefit of everyone: industry, the public, and especially the environment.